Guidehouse

CPUC 2021 PG Model User's Guide

Prepared for California Public Utilities Commission

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OVERVIEW

Guidehouse and its partners prepared this 2021 Potential and Goals Study for the California Public Utilities Commission (CPUC). The purpose of this study is to develop estimates of energy and demand savings potential in the service territories of California's major investor-owned utilities (IOUs) during the post-2021 energy efficiency (EE) rolling portfolio planning cycle.

A key component of the 2021 Study is the Potential and Goals Model (PG Model), which provides a single platform in which to conduct robust quantitative scenario analysis that reflects the complex interactions among various inputs and policy drivers. The model was built in the Analytica platform.

This document provides helpful material for getting started with Analytica as well as links to more comprehensive Analytica tutorials and user guides. Guidehouse has organized information in the following sections:

- General Analytica Instructions:
    - Downloads: How to download Analytica and reference documents
    - Introductory Videos: Links to videos that provide a good first stop for background on how to use Analytica
    - User Guide Excerpts: Highlights from the comprehensive Analytica users guide for quick reference
    - Useful Shortcut Keys: Table of shortcut keys in Analytica
- CPUC PG Desktop Model: how to use run CPUC PG Model on your desktop.

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1. INTRODUCTION TO ANALYTICA

1.1 Downloads

Visit this page to download and install Analytica 5.4. The Analytica Free 101 edition is free and will allow you to run the model.

Tips and recommended documents:

- Check your system properties (Windows Button->Computer->System Properties->System Type) to figure out if you have 32- or 64-bit operating system.
- Download the appropriate free version.
- New users are strongly encouraged to complete the Tutorial document (see "Tutorial" under "Help" menu when you open Analytica). The following tutorials are applicable to model users:
  - Tutorial: Open a model to browse
  - Tutorial: Reviewing a model
  - Tutorial: Analyzing a model
- A user's guide is also available under the "Help" menu when you open Analytica.

Additional information on computer needs from Lumina Decision Systems (maker of Analytica):

System Requirements

Windows OS: Analytica and ADE run on Microsoft Windows 64-bit OS, including Windows 10, 8, 7, Vista, Server, Server 2008, 2012 and 2016. Release 5.2 does not run on Windows 32-bit.

RAM: Analytica runs fine with only 1GB RAM, but it's helpful to have more for larger models. For large models and large Monte Carlo sample sizes, we recommend at least 8GB RAM.

Hard disk: The Analytica installer is under 60MB. When installed, it takes up to 140MB on your hard disk, including Analytica application, solver, example models and libraries.

Screen size: It's helpful to have a large screen if you want to build or view large models, especially if you want to see related documents or spreadsheets.

Macintosh: Analytica does not run on Macintosh OS, but, it does run nicely on a Mac using Parallels or VMWare to run Windows. (Max Henrion, the originator of Analytica and CEO of Lumina, runs Analytica on a Macbook.)

Source: https://lumina.com/support-2/analytica-downloads/ http://www.lumina.com/support/downloads/

1.2 Introductory Videos

Guidehouse recommends viewing the following introductory videos from Lumina:

- Introduction to Analytica
  - https://www.youtube.com/watch?v=9s40FjHBm3E
- Getting Started with Analytica

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- https://www.youtube.com/watch?v=2rm6WTn2js0
- Analytica Tutorial Chapter 1
  - https://www.youtube.com/watch?v=GQV0dnDN0Q0
- Analytica Tutorial Chapter 2
  - https://www.youtube.com/watch?v=mpF4xcmKaao
- Analytica Tutorial Chapter 3
  - https://www.youtube.com/watch?v=scVOq29NMG4

1.3 User Guide Excerpts

Guidehouse has selected the following excerpts from the Lumina-produced user guide to highlight key terminology and navigation features in Analytica. All figures that appear in this section are sourced from the Lumina-produced users guide.[1]

[1] Lumina Decision Systems. (2019). *Analytica User Guide*. Retrieved from Analytica Wiki: https://wiki.analytica.com/index.php?title=Analytica_User_Guide

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1.3.1 Toolbar Introduction

The toolbar appears across the top of the Analytica application window. It contains buttons to open various views of the model, and to change between browse and edit modes.

Navigation toolbar: The first five buttons on the toolbar open a window relating to the variable or the object selected in the active (frontmost) window:

Parent Diagram button: Click to open the Diagram window for the module or model containing the object in the current active Diagram, Object, or Result window. It highlights the object you were viewing in the parent diagram. If you are viewing the top-level model, which has no parent, this button is grayed out. The keyboard shortcut is *F2*.

Outline button: Click to open the Outline window. The outline highlights the object you were previously looking at. The keyboard shortcut is *F3*.

Object windowbutton: Click to open the Object window for the selected node in a diagram or the active module. The keyboard shortcut is *F4*.

Result button: Click to open a Result window (table or graph) for the selected variable. This button is grayed out if no variable is selected. If you have selected more than one variable, it offers to create a compare variable that shows a result combining the values of all the variables. The keyboard shortcut is *Control+r* or *F5*.

Definition button: Click to view the definition of the selected variable. If the variable is defined as a probability distribution or sequence, it opens the function in the Object Finder dialog; if the variable is an editable table (edit table, subtable, or probability table), it opens the **Edit Table** window. Otherwise, an Attribute panel or an Object window opens, depending on the *Edit Attributes* setting in the Preferences dialog. This button is grayed out if no variable is selected. The keyboard shortcut is *Control+e* or *F6*.

Find button: Brings up the Find Dialog. Use this to search for an object in your model by name or other criteria, or from a table to search for text appearing in the table. You can also use it search the Analytica wiki.

Edit buttons: These two buttons control your mode of interaction with Analytica. The shape of the cursor reflects which mode you are in:

Browse tool: Lets you navigate a model, compute and view results, and change inputs. It does not let you change other variables. See Browse mode.

Edit tool: Lets you create new objects, and move and edit existing objects. See Creating and editing nodes.

Tip

If the model is locked as browse-only, or if you are using the Power Player edition or the Free 101 edition with more than 101 user objects, only the browse tool is available.

Source: Lumina

1.3.2 Classes of Variables and Objects

The descriptions provided below are generalized and your model may not align with these definitions exactly. This is especially true for decision nodes in the model, which often represent a user input, rather than a decision to make. Furthermore, the model often employs constant nodes to depict imported data in addition to fixed conversion factors. Lastly, the color scheme within the model may differ from the information below.

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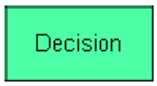
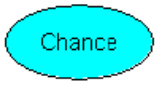
Classes of variables and other objects

The shape of a node indicates the class of the variable or other object:



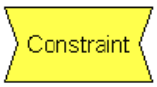
A rectangle depicts a ***decision variable*** — a quantity that the decision maker can control directly. For example, whether or not you take an umbrella to work is your decision. If you are bidding on a contract, it is your decision how much to bid.



An oval depicts a ***chance variable*** — that is an uncertain quantity whose definition contains a probability distribution. For example, whether or not it will rain tomorrow is a chance variable (unless you are a rain god). And whether or not your bid is the winning bid is a chance variable in your model, although it is a decision variable for the person or organization requesting the bid.

A hexagon depicts an ***objective variable*** — a quantity that evaluates the relative value, desirability, or utility of possible outcomes. In a decision model, you are trying to find the decision(s) that maximize (or minimize) the value of this node. Usually, a model contains only one objective.

A rounded shape (with thin outline) depicts a ***general variable*** — a quantity that is not one of the above classes. It can be uncertain because it depends on one or more chance variables. Use this class initially if you're not sure what kind of variable you want. You can change the class later when it becomes clearer.



An hourglass shape depicts a ***constraint*** — a relationship utilized when solving constrained optimization problems in the Analytica Optimizer edition. The constraint node appears on the toolbar only when using Analytica Optimizer. Optimization is covered in the *Optimizer user guide*.

A rounded node (with thick outline) depicts a ***module*** — that is, a collection of nodes organized as a diagram. Modules can themselves contain modules, creating a nested hierarchy.

A parallelogram depicts an ***index variable***. An index is used to define a dimension of an array. For example, *Year* is an index for an array containing the U.S. GNP for the past 20 years. Or *Nation name* is an index for an array of GNPs for a collection of nations. Indexes identify the row and column headers of a table, and the axes and key of a graph (see "Introducing indexes and arrays" on page 150).

A trapezoid depicts a ***constant*** — that is, a variable whose value is fixed. A constant is not dependent on other variables, so it has no inputs. Examples of numerical constants are the atomic weight of oxygen (16) or the number of feet in a kilometer. It is clearer to define a constant for each such value you need in a model, so you can refer to them by name in each definition that uses it, rather than retyping the number each time.

A shape like an arrow tail depicts a ***function***. You can use existing functions from libraries, and define new functions to augment the functions provided in Analytica. See Chapter 21, "Building Functions and Libraries."

This node is a ***button*** — when you click a button (in browse mode), it executes its script to perform some useful action. You can use buttons with any edition of Analytica, but you need Analytica Enterprise or Optimizer to create a new button (see "Creating buttons and scripts" on page 407).

Source: Lumina

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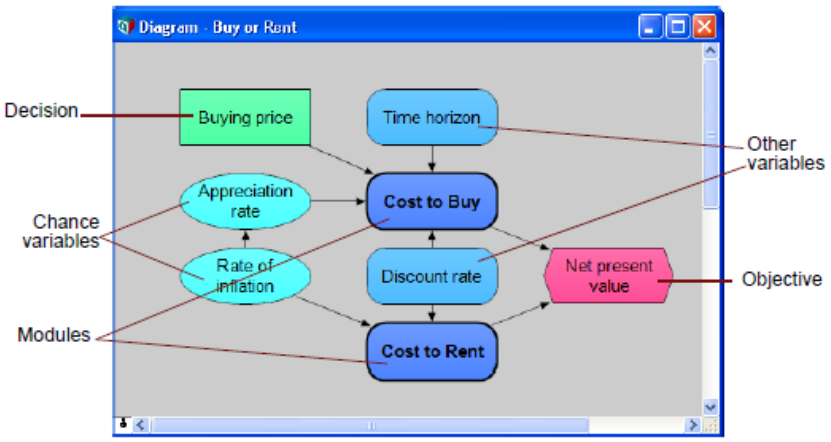
1.3.3 Influence Diagrams

Diagram window

When you open a model, it shows a **Diagram** window. This window usually shows an ***influence diagram***, like this.

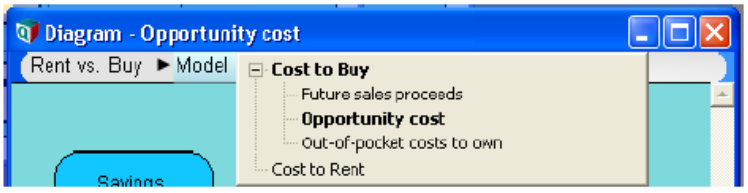


Each ***node*** depicts a variable (thin outline) or module (thick outline). The node shape and color tells you its class — decision, chance, objective, module, and so on. The arrows in a **Diagram** window depict the ***influences*** between variables. An influence arrow from variable **A** to variable **B**, means that the value of **A** influences **B**, because **A** is in the definition of **B**. So, when the value of **A** changes, it can change the value (or probability distribution) for **B**.

In the diagram above, the arrow from **`Buying price`** to **`Cost to buy`** means that the price of the house affects the overall cost of purchasing it. The influence diagram shows the essential qualitative structure of the model, unobscured by details of the numbers or mathematical formulas that can underlie that structure. For more on using influence diagrams to build clear models, see Chapter 7, "Creating Lucid Influence Diagrams."

If you check the *Show module hierarchy* box, the top of the active **Diagram** window displays the module path down to the current module:

You can jump to any parent or ancestor module by clicking on its name in the strip. When you click on an arrow, a tree menu displays other modules at that level and enables you to quickly navigate directly to any other module in the model:



Source: Lumina

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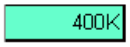
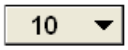
1.3.4 Input/Output Nodes

Viewing input nodes



An input field lets you see a single number or text value. Click in the box to edit the value. If it's a text value, you must put matching quotes around it (single or double).



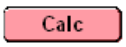
A pull-down menu lets you choose from a list of options. Press the menu to see the list.

Click the **List** button to open a list of values, usually defining an Index. To change a value, click in its cell. For more about lists, see "Editing a list" on page 171.

Click to open an edit table showing an editable array with one or more dimensions displayed as a table. For more, see "Editing a table" on page 178.

Click to view and edit a probability distribution in the **Function Finder**. For more, see "Probabilistic calculation" on page 250.

Viewing output node values



Click the **Calc** button to compute and display the value of this output variable. When computing is complete, it shows a number in this node, or, if it's an array, it changes to the **Result** button and opens a **Result** window showing a table or graph. See Chapter 3, "Result Tables and Graphs" for more.

The **Result** button shows that an array has been calculated. Click it to open a **Result** window showing a table or graph. See Chapter 3, "Result Tables and Graphs" for more.

Opening module details

To see the structure of the model, double-click the module **Model details**, to display its diagram window (see "The Object window" on page 20).

Source: Lumina

1.3.5 Numeric Suffixes

Suffix characters Suffix is Analytica's default format. It uses a conventional letter after each number to specify powers of 10: 12K means 12,000 (*K* for kilo or thousands), 2.5M means 2,500,000 (*M* for Mega or millions), 5n means 0.000,000,005 (*n* means nano or billionths). Here are the suffix characters:

Power of 10	Suffix	Prefix	Power of 10	Suffix	Prefix
			10^{-2}	%	percent
10^{3}	K	Kilo	10^{-3}	m	milli
10^{6}	M	Mega or Million	10^{-6}	μ or u	micro (mu)
10^{9}	G or B	Giga or Billion	10^{-9}	n	nano
10^{12}	T	Tera or Trillion	10^{-12}	p	pico
10^{15}	Q	Quadrillion	10^{-15}	f	femto

Tip Note the difference between "M" for Mega or Million and "m" for milli (1/1000). This is the only situation in which Analytica cares about the difference between uppercase and lowercase. Otherwise, it is insensitive to case (except when matching text values).

Source: Lumina

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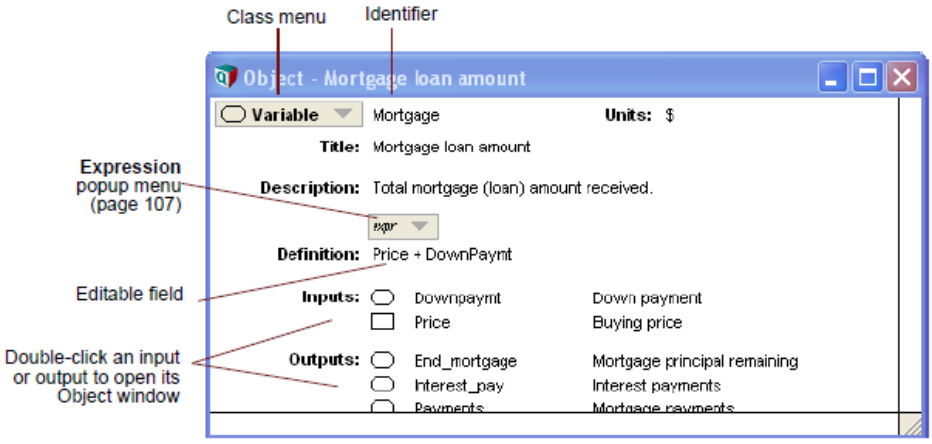
1.3.6 Attributes of a Variable

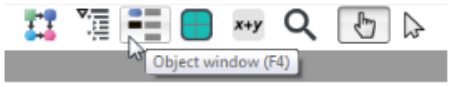
The Object window

The ***Object window*** shows the attributes of an object. All objects have a class and identifier — a unique name of up to 20 characters. A variable also has a title, units, description, definition, inputs, and outputs.



To open an object window: Here are some ways to open the **Object** window for an object **X**:

- Double-click **X** in a Diagram window.
- Select **X** in its Diagram window and click the **Object** button (or the F4 key shortcut) in the navigation toolbar:



- Double-click the entry for **X** in the Outline window.
- If a **Result** window for **X** is displayed, click the **Object** button in the navigation toolbar.
- Double-click **X** in the **Inputs** or **Outputs** list of a variable in an **Object** window.

Returning to the parent diagram: Click the **Parent Diagram** button in the navigation toolbar to see the diagram that contains this object, with the object's node highlighted.

Source: Lumina

1.3.7 Attribute Panel

The Attribute panel

The ***Attribute panel*** offers a handy way to rapidly explore the definitions, descriptions, or other attributes of the variables and other nodes in a **Diagram** window. You can open the panel below the diagram, and use it to view or edit any attribute of the node you select. It shows the same attributes that you can see in the **Object** window, and often several other attributes.

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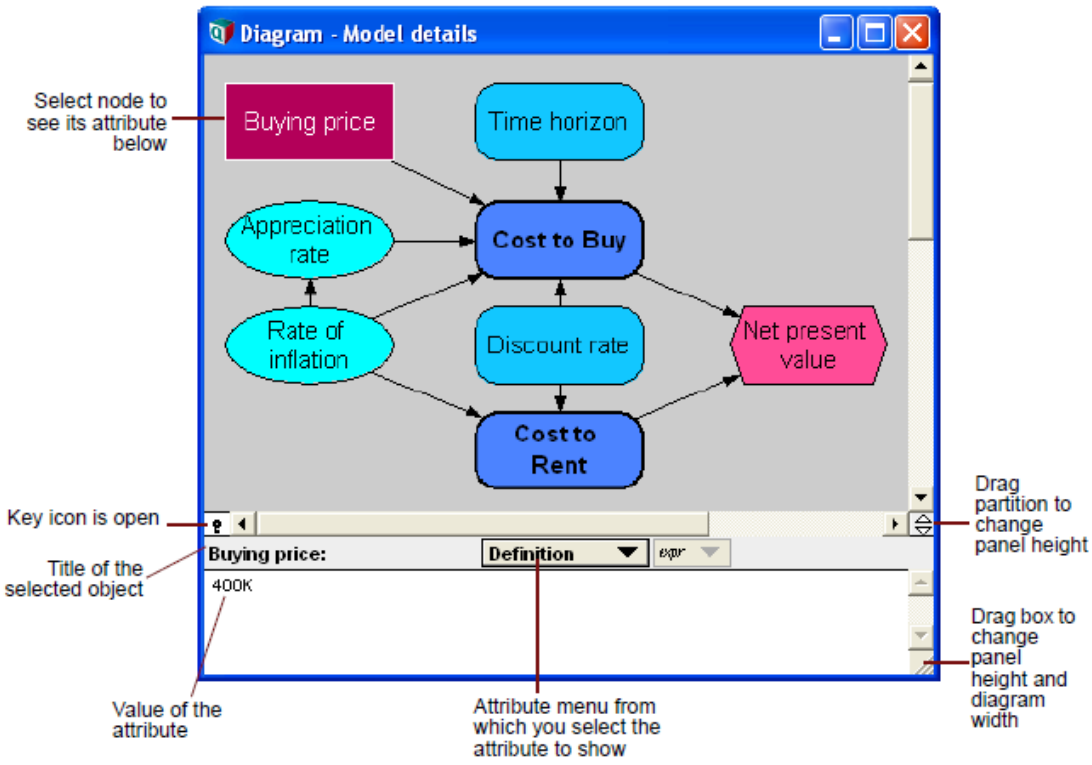
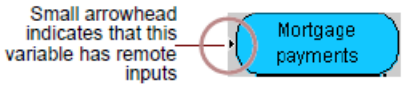


Click the key icon to open the **Attribute** panel. Here are things you can do in this panel:

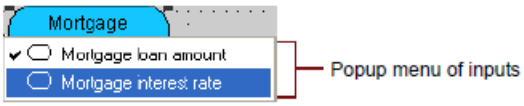
- Select another node in the diagram to see the selected attribute of a different object.
- Click the background of the diagram to see the attributes of the parent module.
- Select another option from the **Attribute** menu to see a different attribute.
- To enter or edit the attribute value, make sure you are in edit mode, and click in the **Attribute** panel, and start typing. (Not all attributes are user-editable.)

Seeing remote inputs and outputs

When a variable has a Remote input — that is, it depends on a variable in another module — a small arrowhead appears to the left of its node. Similarly, if it has a remote output, a small arrowhead appears to its right. Press on the arrowhead to quickly view and navigate influences between nodes in different diagrams (modules).



To see a list of the inputs (or outputs), remote and local, press the arrowhead on the left (or right) of the node.



To jump to a remote input or output, select it from the list and stop pressing. It opens the **Diagram** window containing the remote variable, and highlights its node.

Source: Lumina

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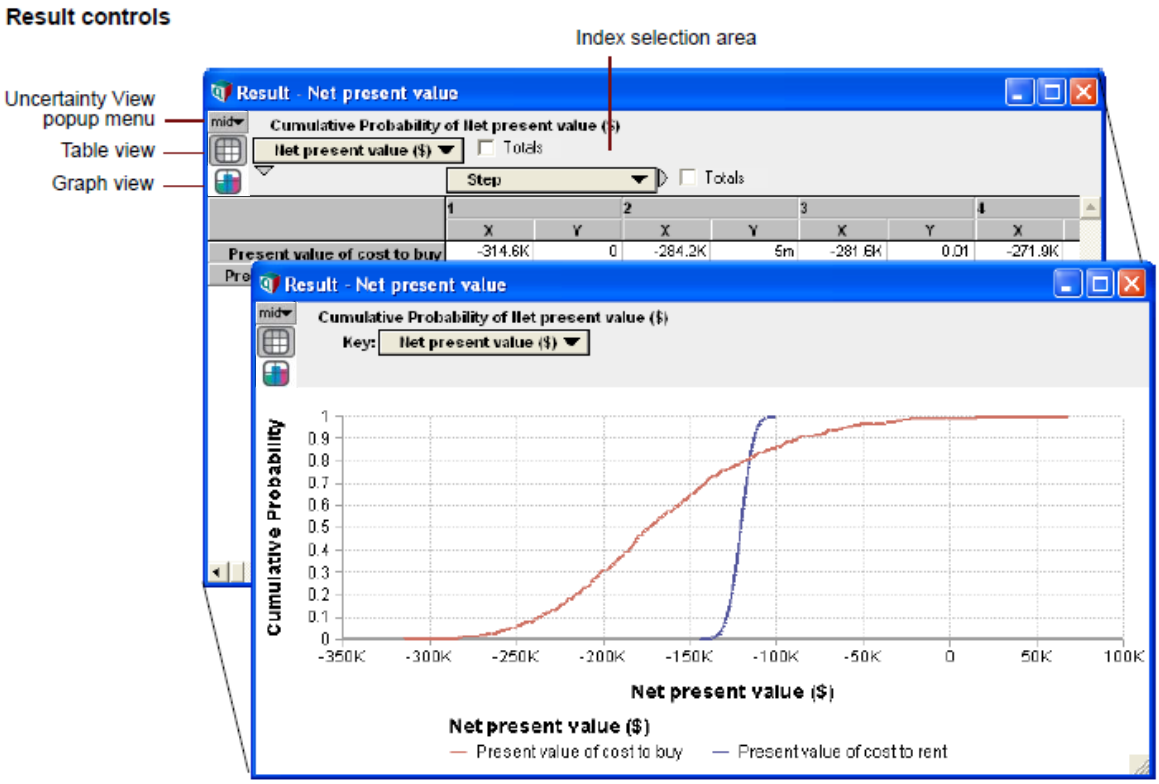
1.3.8 Result Viewing Options

There are many options for viewing results. Note that in the uncertainty view menu, only the “Mid value” (i.e., deterministic results) is valid because this is not a probabilistic model.



To open a Result window

Click the variable node in its influence diagram to select it, and do one of these:

- Click the **Result** button in the toolbar, or press key *Control+r*.
- Select **Show Result** from the **Result** menu.
- Select an **uncertainty view** option, such as **Mid Value**, **Mean Value**, or **Cumulative probability**, from the **Result** menu.
- In the **Attribute** panel below a diagram, select **Value** or **Probvalue** from the **Attribute** menu, and click the **Calc** or **Result** button.

To open a **Result** window for an output node, simply click its **Calc** or **Result** button.

Result controls

The ***Result controls***, in the upper-left corner of the **Result** window include these controls:

mid

Press the **Uncertainty View** popup menu (page 29), to select how to display an uncertain quantity.

Click this button to display the result as a **table**.

Click this button to display the result as a **graph**.

Toggle between the table and graph views using the **Table View** and **Graph View** buttons.

Source: Lumina

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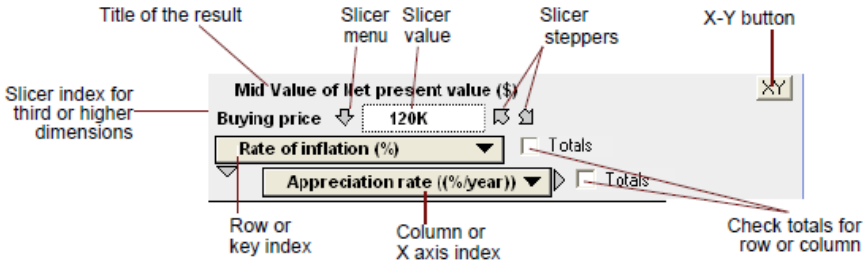
Index selection

The **Index selection** area is the top part of a **Result** window. For a table, it shows which index goes down the rows, and which goes across the columns. For a graph, it shows which index is on the X axis (and sometimes Y axis) and which is in the key. For either view, if the array has too many dimensions to display directly, it also shows ***slicers*** that select the values of the extra indexes. Each control has a popup menu to let you exchange indexes and rearrange (***pivot***) the view.



The index selection area of a graph or table contains these items (example variables and indexes in the following text refer to the figure above):

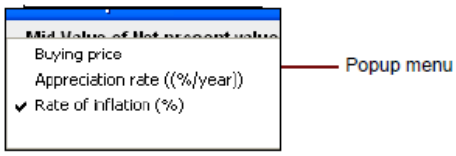
Title Shows the uncertainty view (mid, mean, etc.), the title of the variable, and its units, e.g., `Mid Value of Costs of buying and renting ($)`.

Slicer index The title, units, and value of any index(es) showing dimensions not currently displayed in the table or graph.

Slicer menu Press for a popup menu from which you can change the slicer value for the results displayed.

Slicer stepper arrows Click or to cycle up or down through the slicer values.

Row or key index Shows the title of the index displayed down rows for a table, or in the color key for a graph. Press to open a menu from which you can select another index.



Column or X axis index Shows the title of the index displayed across the columns for a table, or along the X (horizontal) axis for a graph. Press to open a menu from which you can select another index.

XY button Click XY to plot this variable against one or more other variables, or to plot one slice of this variable against another slice. See "XY comparison" on page 95.

Totals checkboxes Check a box to show row or column totals the table view. If you check *Totals* for an index and then pivot it to be a slicer index, "Totals" becomes its default slicer value. This lets you show total values over the slicer index in the graph or table.

Source: Lumina

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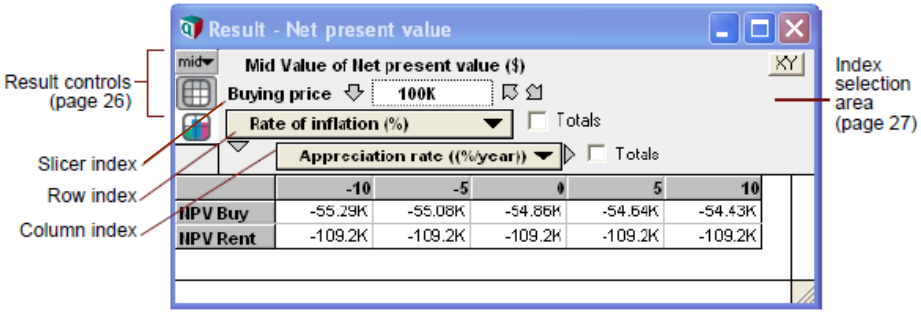
Viewing a result as a table

Toggle to table view If a result window shows a graph, click on the top-left to switch to table view.



Three-dimensional table

The index display options depend on the number of dimensions in the variable.

Row index (down) Use this menu to select which index to display down the rows of the table. Select blank to display a single row.

Column index Use this menu to select which index to display across the columns of the table. Select blank to display a single column.

Slicer index(es) If the array has more than two indexes, the extra index(es) are shown as **Slicer** menus. The table shows values only for the slice (subarray) setting the slice index to the shown slicer value. Open the slicer menu and select a different slicer value, or click or to step through the slicer values.

Formatting numbers To specify the format for the numbers in a table or along the Y (usually vertical) axis of a graph, show the graph and select **Number Format** from the **Result** menu, or press *Control-b*. The **Number format dialog** (page 78) offers many options, including currency signs, dates, and Booleans.

Source: Lumina

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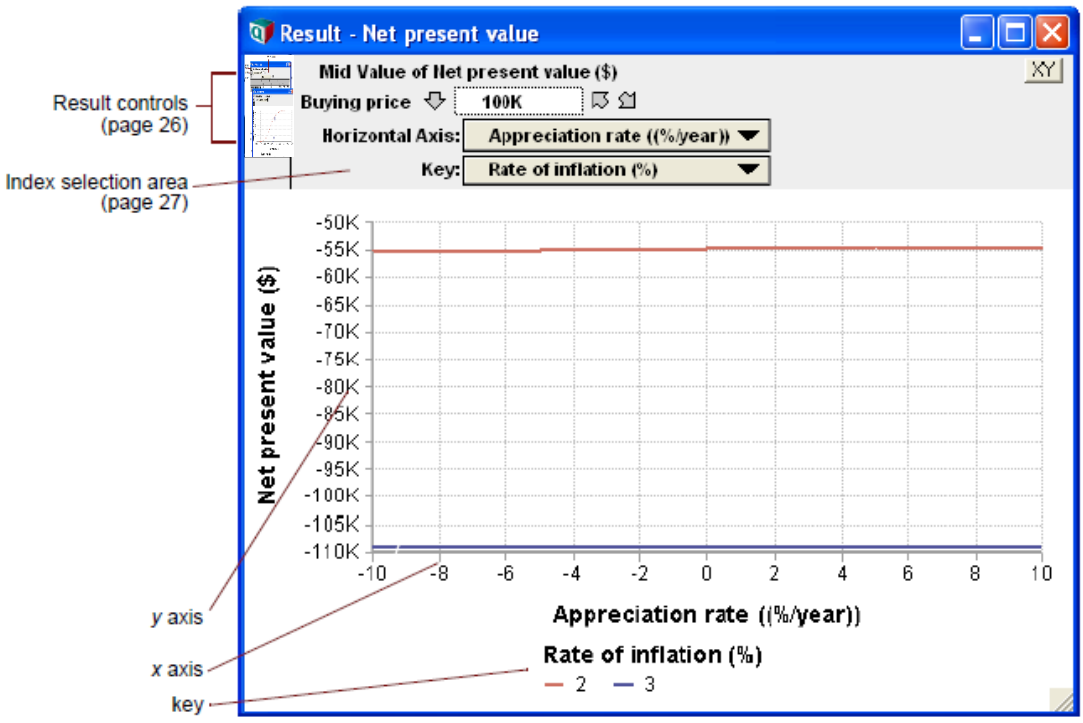
Viewing a result as a graph

Toggle to graph view If a result window shows a table, click on the top-left to switch to graph view.



The **y** axis, usually vertical, plots the values of the variable. The **x** axis, usually horizontal, shows the value of a selected index. The index display options depend on the number of dimensions in the variable.

X axis If the array has more than one index, use this menu to select which index to display along the **x** axis (usually horizontally).

Key index If the array has more than one index, use this menu to select which index to display in the key, usually showing each value by color.

Slicer index(es) If the array has more indexes than you can assign graphing roles (such as **x** axis or key), the extra indexes are shown as **Slicer** menus, as in a table view. The graph shows values only for the slice (subarray) setting the slice index to the shown slicer value. Open the slicer menu and select a different slicer value, or click or to step through the slicer values.

To reorder slicers If the graph has more than one slicer index, you can reorder the slicer indexes simply by dragging one up or down.

Graph setup options There is a rich variety of ways to customize the graph, including line style (lines, data points, symbols, barcharts, stacked bars, thickness, transparency), axis ranges, log or inverted axes, grid and tickmarks, background colors, and font color and size. To change these settings, open the **Graph Setup dialog** (page 85) and do one of the following:

- Select **Graph Setup** from the **Result** menu.
- Double-click anywhere on a graph in the **Result** window.

Source: Lumina

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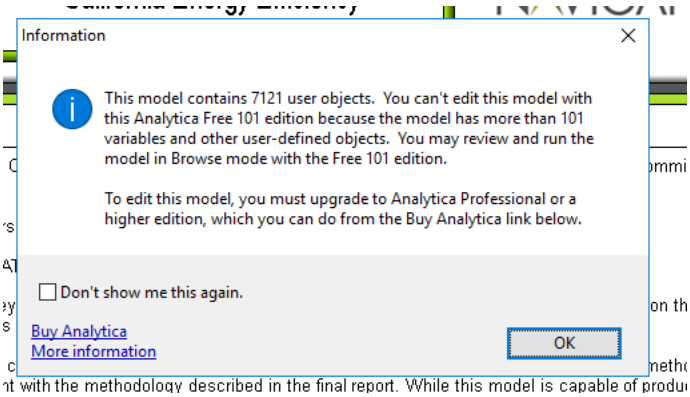
2. CPUC PG Desktop Model

This section provides exercises related to changing key model settings and viewing results. To perform these exercises, you will first need to open the model.

2.1 Opening the Model

Open the model by double-clicking on the CPUC_2021_PG_Model.ana file in the folder where it resides. After you have opened the model file, you will see an “Information” pop-up like the one shown in Figure 2-1 if you are using Analytica Free 101. This is not an error and will not cause any issues with the model. Click “OK” to proceed to the Disclaimer and Terms of Use.

Figure 2-1. Initial Pop-up



The next screen will show the disclaimer, terms of use, and runtime notes as shown in Figure 2-2. Click “Accept” to proceed to the main top-level Graphical User Interface (GUI) as shown in Figure 2-3.

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Figure 2-2. Disclaimer and Terms of Use

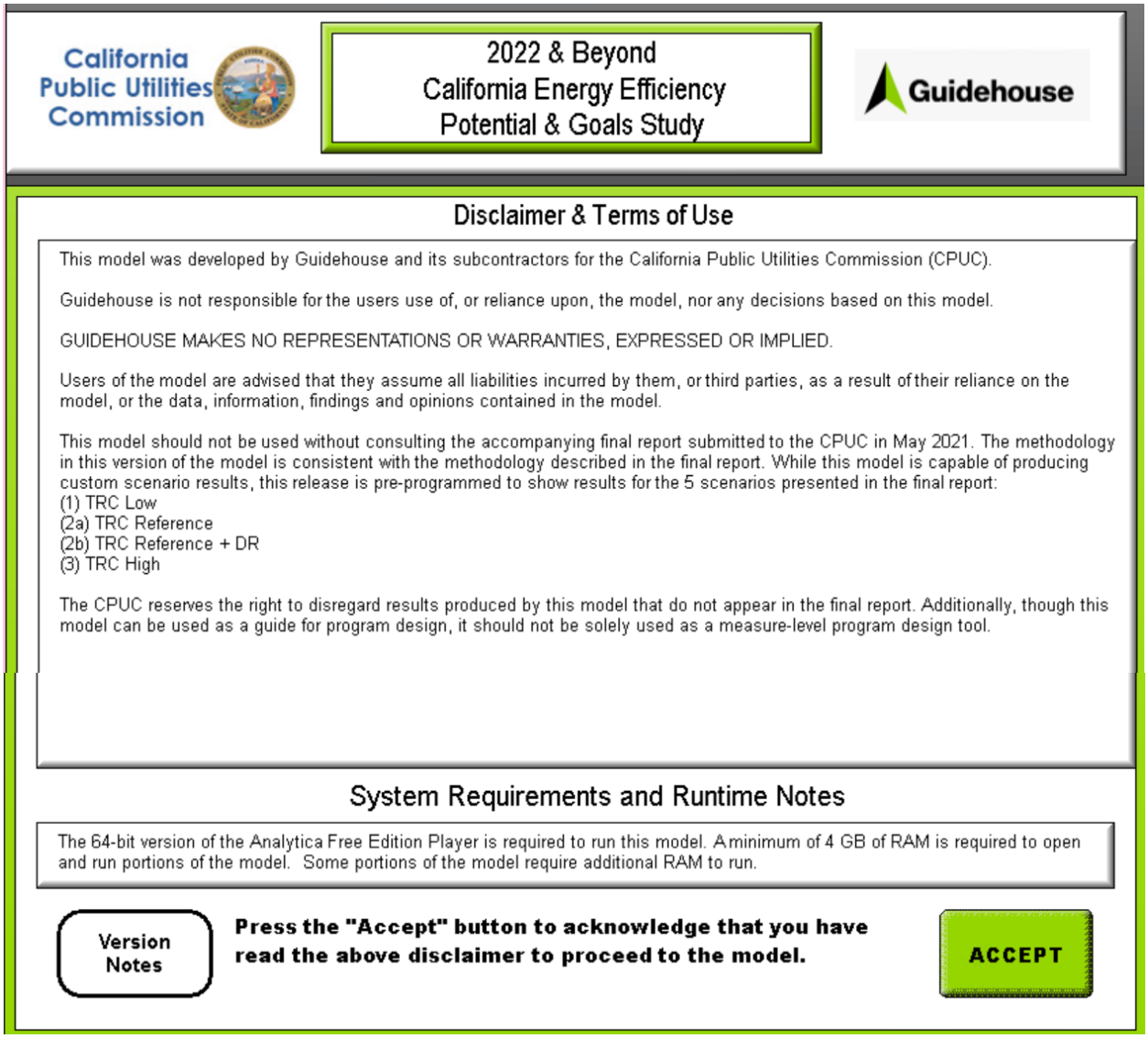

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Figure 2-3. Graphical User Interface

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2.2 Changing Key Model Settings and Viewing Results

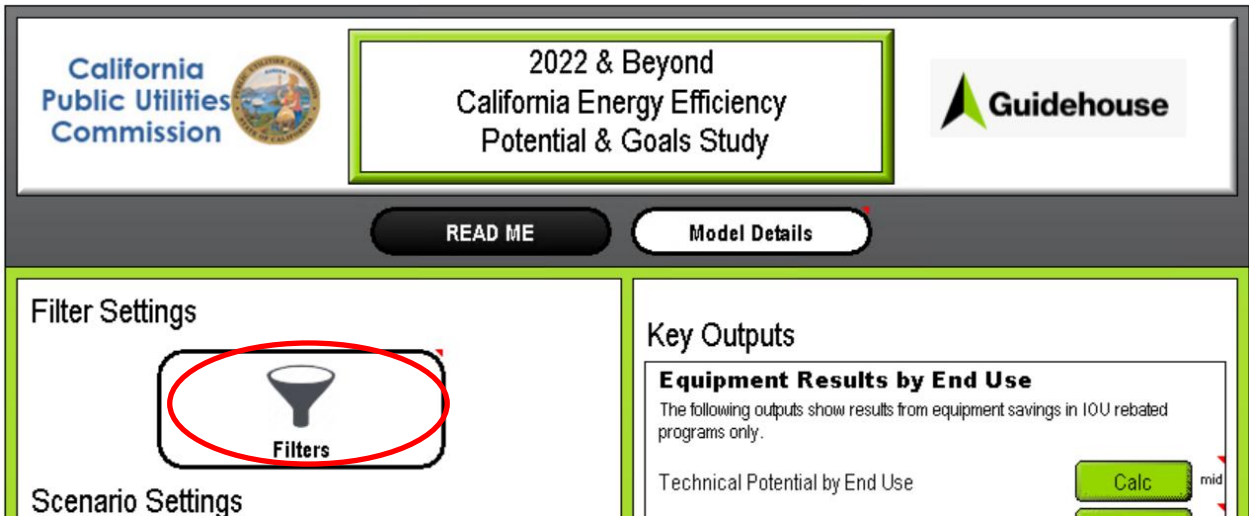
Note that the figures in this section are illustrative. For the most up-to-date modeling results, please use the results viewing dashboard or the model.

2.2.1 Exercise: Using Measure Filters

Goal: In this exercise, you will learn how to use measure filters to run subsets of the model based on the available filters provided: building type, utility, end use, replacement type, and measure name. By using filters you decrease the amount of data the model processes decreasing model run time and RAM usage.

1. Open the “Filters” module by double-clicking on the module (or use CTRL+F to search for the Filters identifier)

Figure 2-4. Measure Filters Module in Top-level GUI



This should then open the GUI. Depending on the utility and model version, there may already be a set of filters that have been applied. For the purposes of this exercise, please set all the filter dropdowns to “None”, as shown below.

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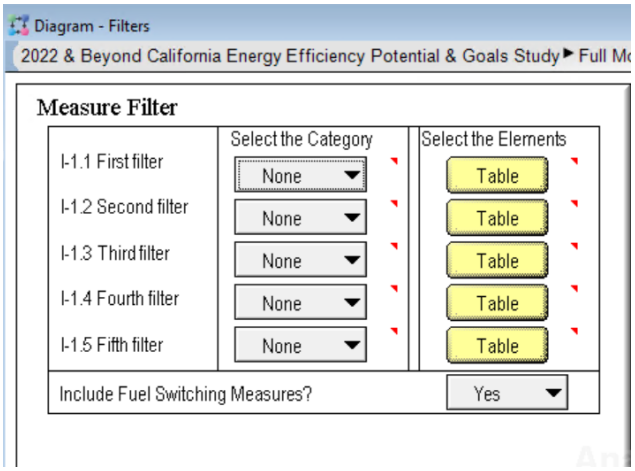
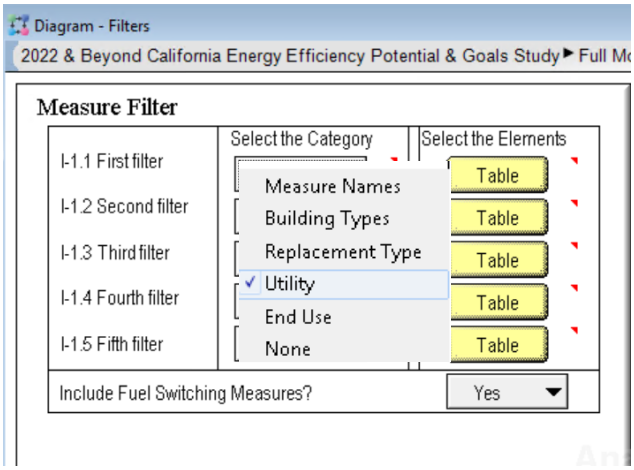
Figure 2-5. Measure Filters GUI



2. Next, the goal is to run a subset of the model by selecting one utility and a subset of building types. To do this, set the first filter category to “Utility” and the second filter category to “Building Type” using the drop-down menus.

Figure 2-6. Set the First Filter Category to Utility



Once the filter categories for the first and second filters have been set, the filter elements need to be selected by clicking on the “Edit Table” buttons as shown below to the right of the drop-down menus. For this exercise, select only one service territory as appropriate (e.g., PG&E) and only the building types that correspond to the commercial sector. This is done by placing 1s next to the elements to be included and 0s next to elements to be excluded. Copy-paste functionality is supported in tables. Figure 2-7 below illustrates the use of the “Edit Tables” to select filter elements for one service territory (PG&E) and the commercial sector.

Figure 2-7. Set the First and Second Filter Elements

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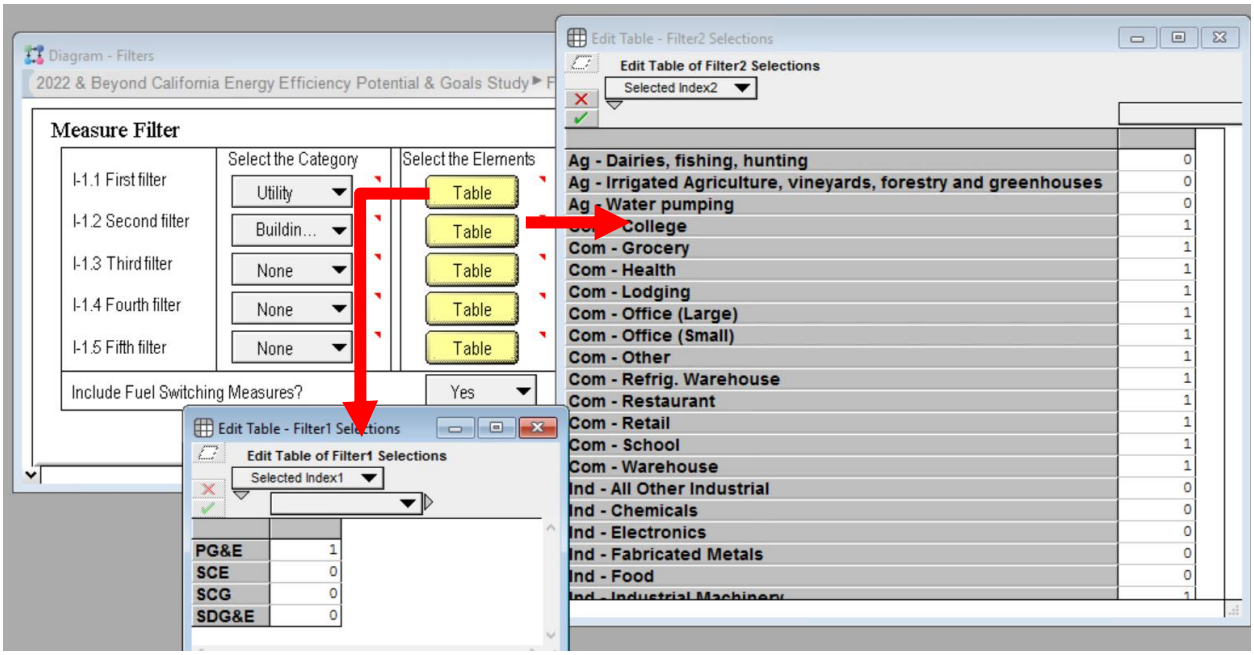
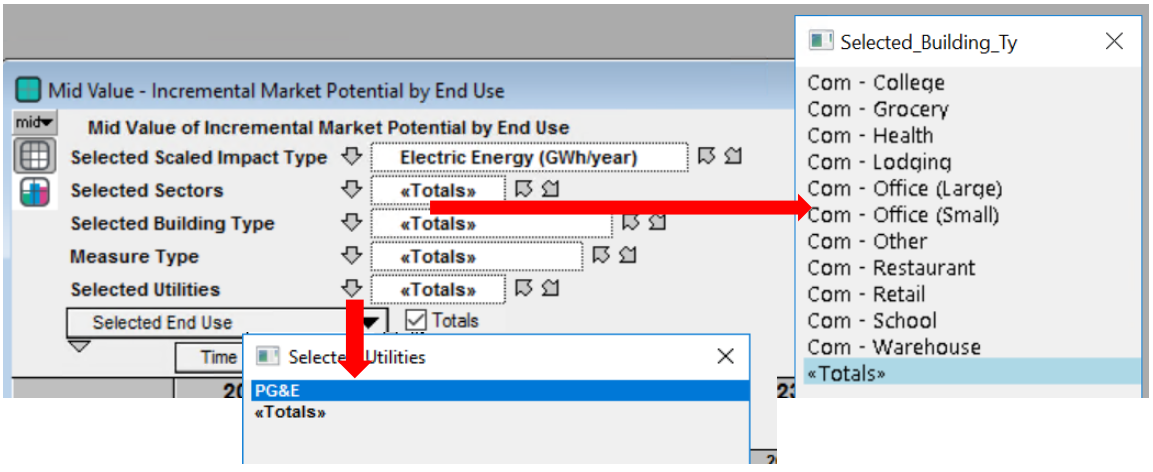
3. To verify that the filter settings are correct, go to the top-level GUI and click the “Calc” button next to “Incremental Market Potential by End Use” under the “Key Outputs” section (or use CTRL+F to search for the identifier Incremental_Market_P).

Figure 2-8. Location of Calc Button for Incremental_Market_P in GUI



After the result has been computed, you can verify that the drop-downs for “Selected Building Types” and “Selected Utilities” are correct by clicking on the downward facing arrow next to each Index element as shown below.

Figure 2-9. Verifying Index Elements in Result Window



Optional Task: For further practice, go back to the “Measure Filters” module and select residential building types to run in addition to the commercial building types. Now go back and recompute Incremental_Market_P to verify that the appropriate building types show up in the “Selected Building Types” index.

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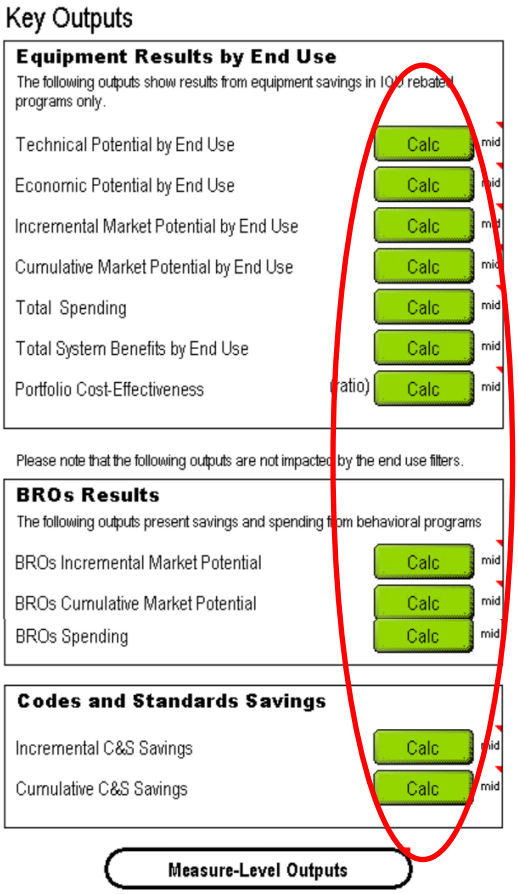
2.2.2 Exercise: Viewing Key Outputs in the GUI

Goal: The goal of this exercise is to use the GUI to display model results.

1. Navigate to the right-hand side of the GUI to access key outputs. Hover over any of the text to the left of the "Calc" buttons to see a description of the node. Then, click on the "Calc" button to generate results for the settings selected on the left-hand side of the GUI. **Depending on the filters applied and output result, these results can take a few seconds to several minutes to run**. A progress bar will apear as the model is running to indicate status of calcultions.

Figure 2-10. Accessing Key Outputs in GUI



2. To access outputs displayed by measure, double click on the node labeled 'Measure-Level Outputs". This will open a window as shown in Figure 2-11, and results can be viewed by clicking on any of the green buttons.

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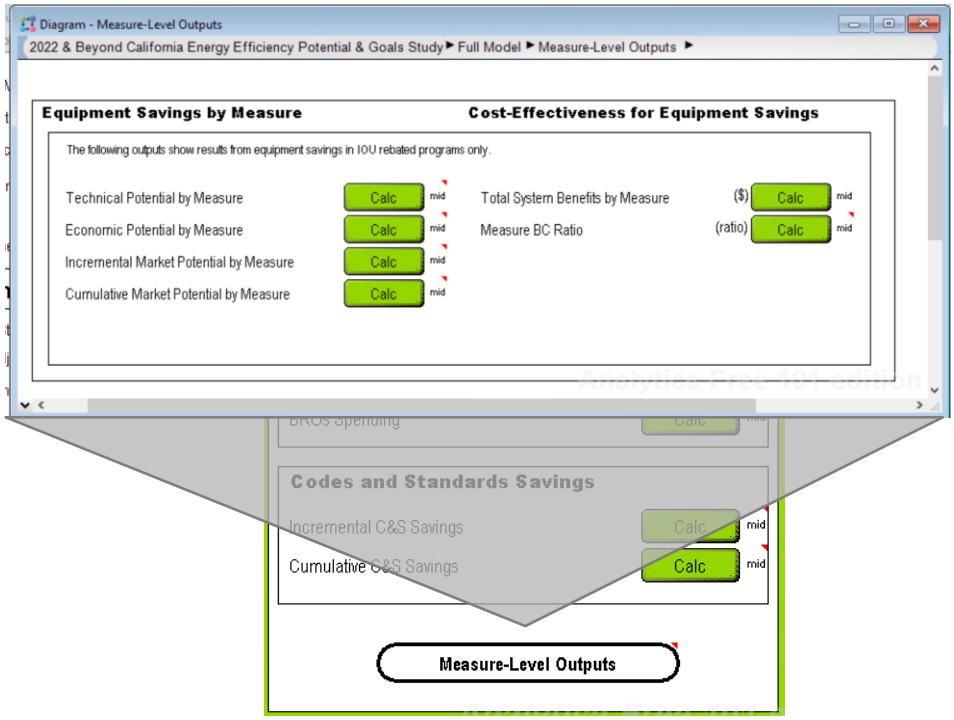
Figure 2-11. Accessing Measure-Level Outputs

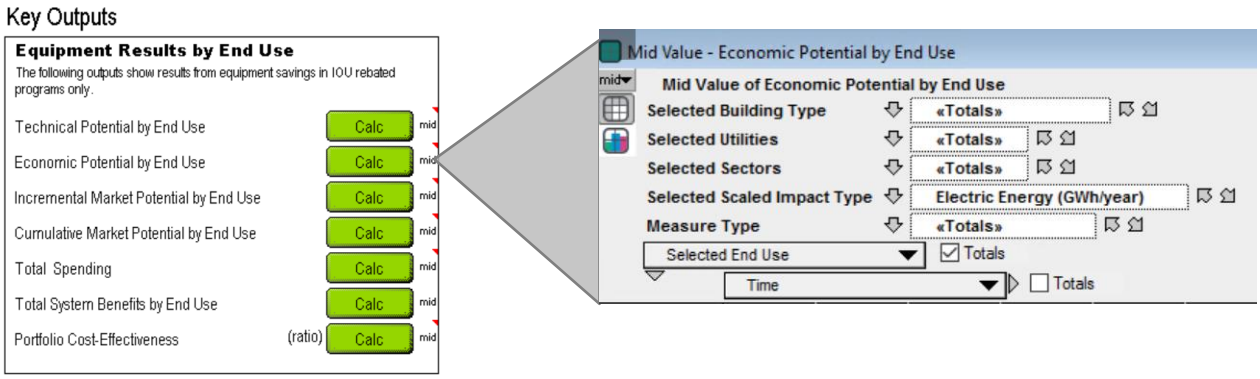


2.2.3 Exercise: Changing Key Inputs in the GUI

Goal: The goal of this exercise is to make a change to one or more key inputs in the GUI and re-evaluate the model. This will help you get familiar with making changes to model settings and inputs using the customized GUI.

1. Evaluate “Economic Potential by End Use” to examine the Economic Potential before making custom changes to the cost settings.

Figure 2-12. Location of Calc Button for Economic Potential



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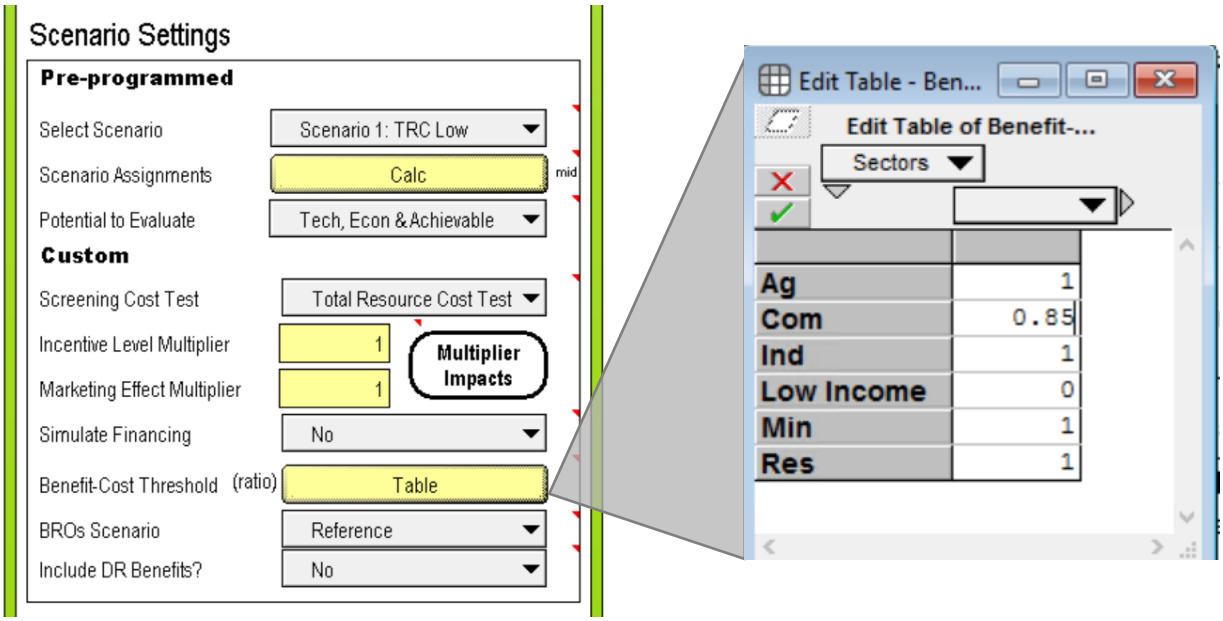
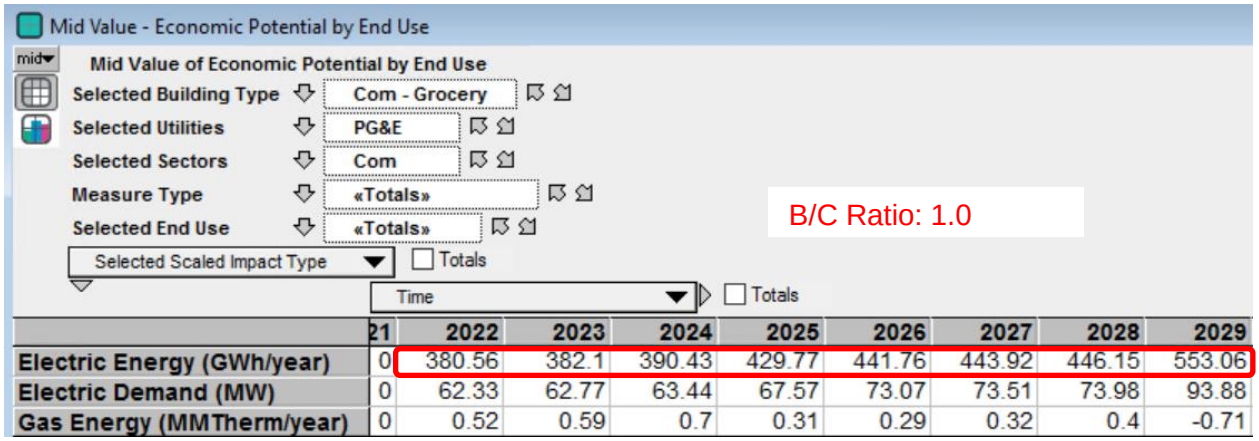
2. Click on the “Table” button next to “Benefit-Cost Threshold” and change the ratio for Commercial to 0.85 as illustrated in Figure 2-13.

Figure 2-13. Edit Table for Benefit-Cost Threshold



3. To verify the impact of changing this input, evaluate the output node “Economic Potential by End Use”. You should now see a noticeable increase in the Economic Potential due to a lowering of the Benefit-Cost Threshold, as illustrated in Figure 2-14 below.

Figure 2-14. Verifying Impact of Changing B/C Ratio



	21	2022	2023	2024	2025	2026	2027	2028	2029
Electric Energy (GWh/year)	0	380.56	382.1	390.43	429.77	441.76	443.92	446.15	553.06
Electric Demand (MW)	0	62.33	62.77	63.44	67.57	73.07	73.51	73.98	93.88
Gas Energy (MMTherm/year)	0	0.52	0.59	0.7	0.31	0.29	0.32	0.4	-0.71

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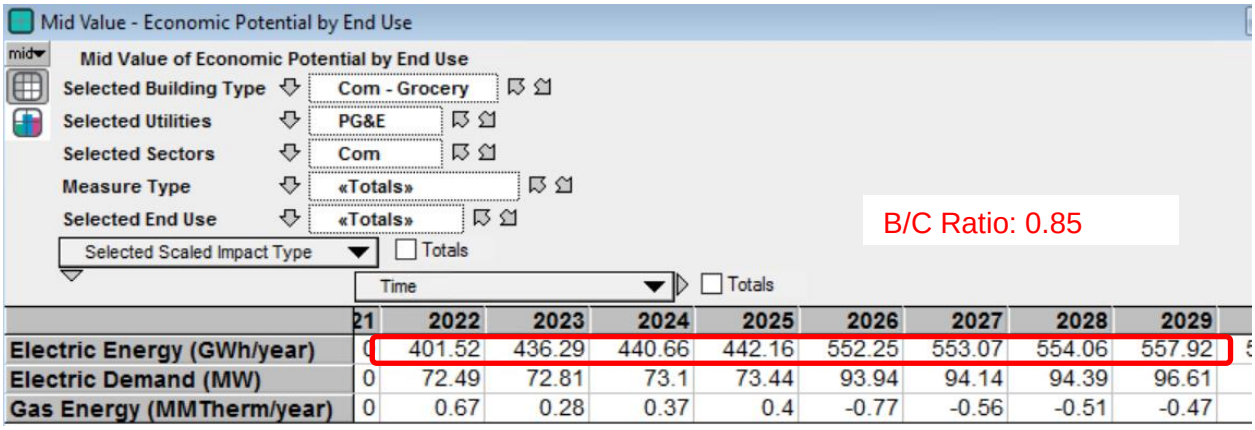

	21	2022	2023	2024	2025	2026	2027	2028	2029
Electric Energy (GWh/year)	0	401.52	436.29	440.66	442.16	552.25	553.07	554.06	557.92
Electric Demand (MW)	0	72.49	72.81	73.1	73.44	93.94	94.14	94.39	96.61
Gas Energy (MMTherm/year)	0	0.67	0.28	0.37	0.4	-0.77	-0.56	-0.51	-0.47

Note: While this exercise only covered changing the B/C Threshold, all dropdown menus, tables, and input fields on the left-hand side of the GUI can all be modified to generate custom results. Note that selecting a scenario under "Pre-Programmed" scenarios will auto-populate all fields according to the table "Scenario Assignments". Additional inputs can be found by double-clicking the "Additional Assumptions" module.

2.2.4 Exercise: Pivoting and Customizing Result Tables and Graphs

Goal: The goal of this exercise is to learn how to pivot indexes in result tables as well as to customize graphs. When representing multi-dimensional results, Analytica will display only a two-dimensional slice of the data. This exercise will show you how to change the orientation and selection of data by pivoting the graph or table. It will also illustrate how to make changes to graph settings.

1. For this exercise, you will first run the model with customer segments across a subset of building types. Using the "Filters" module, select your desired customer segments. The example shown in Figure 2-15 was run with the first four Commercial segments selected.
2. Re-evaluate the result node "Incremental Market Potential by End Use" (Incremental_Market_P). You should see a default graphical view as shown in Figure 2-15 with "Time" on the horizontal axis and "Incremental Market Potential by End Use" on the vertical axis. The task is to pivot this graph such that we can graphically view the sum total achievable potential across all building types over time.

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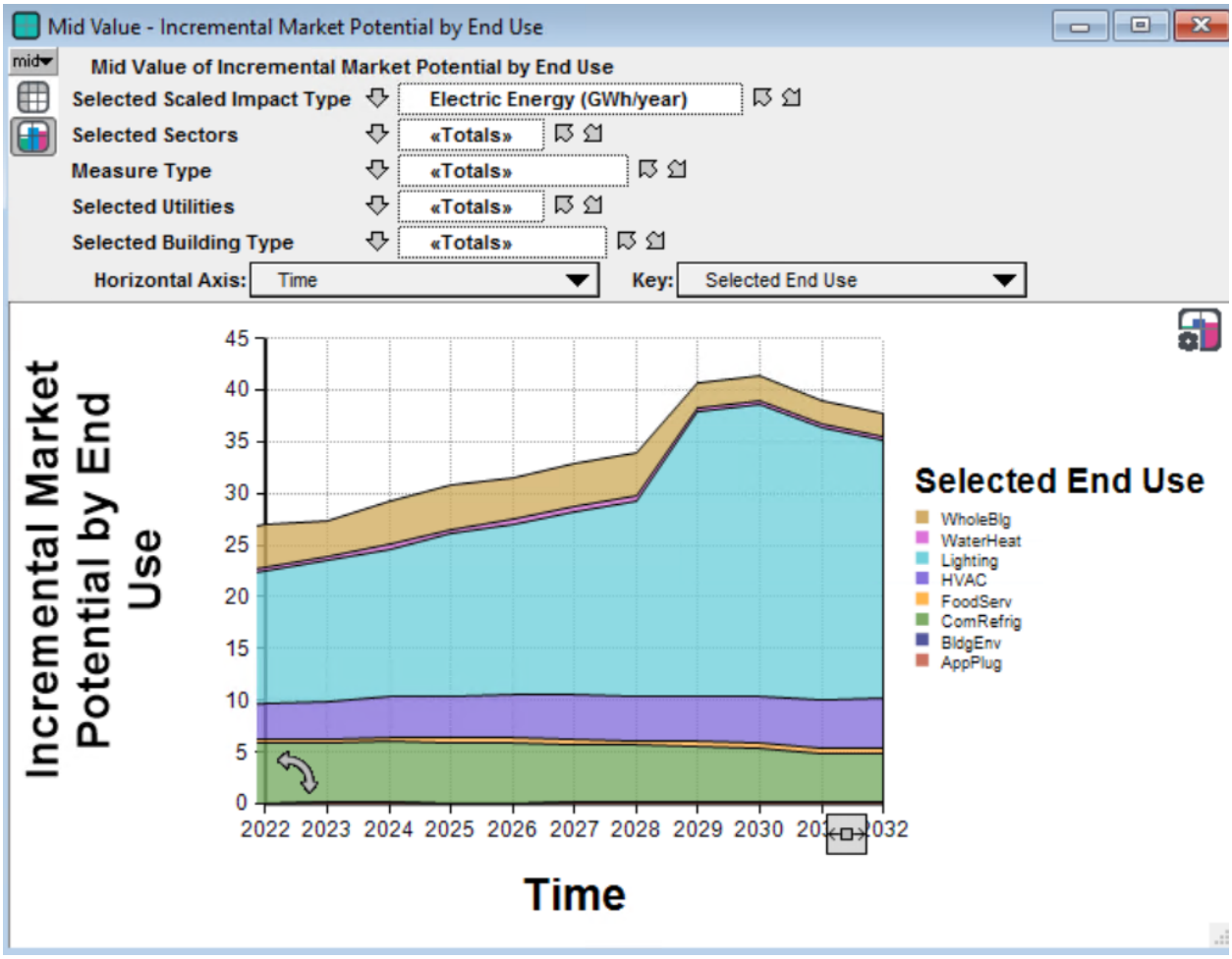
Figure 2-15. Default Graphical View of Incremental_Market_P



3. To accomplish this, click on the drop-down next to “Key” and select “Selected Sectors” from there as shown in Figure 2-16. The updated result graph should look like the screenshot in Figure 2-17.

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Figure 2-16. Changing Graph Key to Selected Building Types

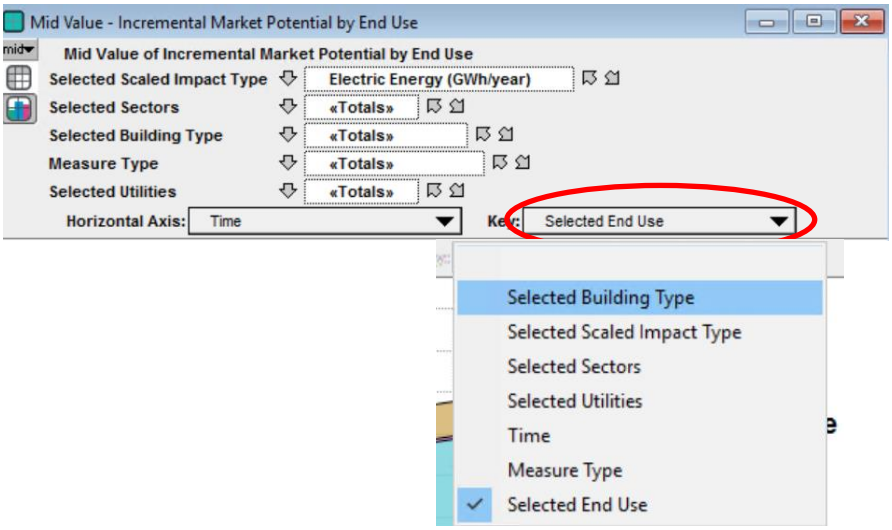
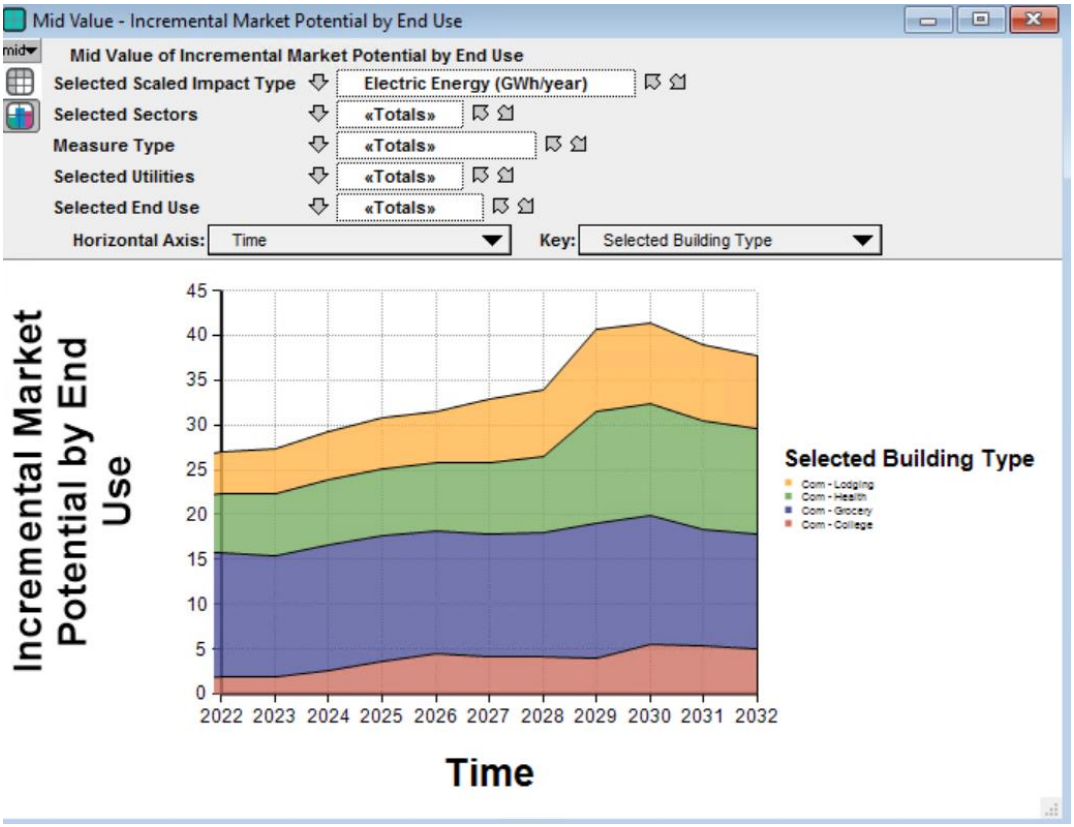


Figure 2-17. Result Graph after Key Change



4. Next, to graphically view achievable potential across both selected sectors, right click on the graph and select “Graph setup” to open the dialog box as shown below (alternatively, you can double-click on the graph to open the dialog box).

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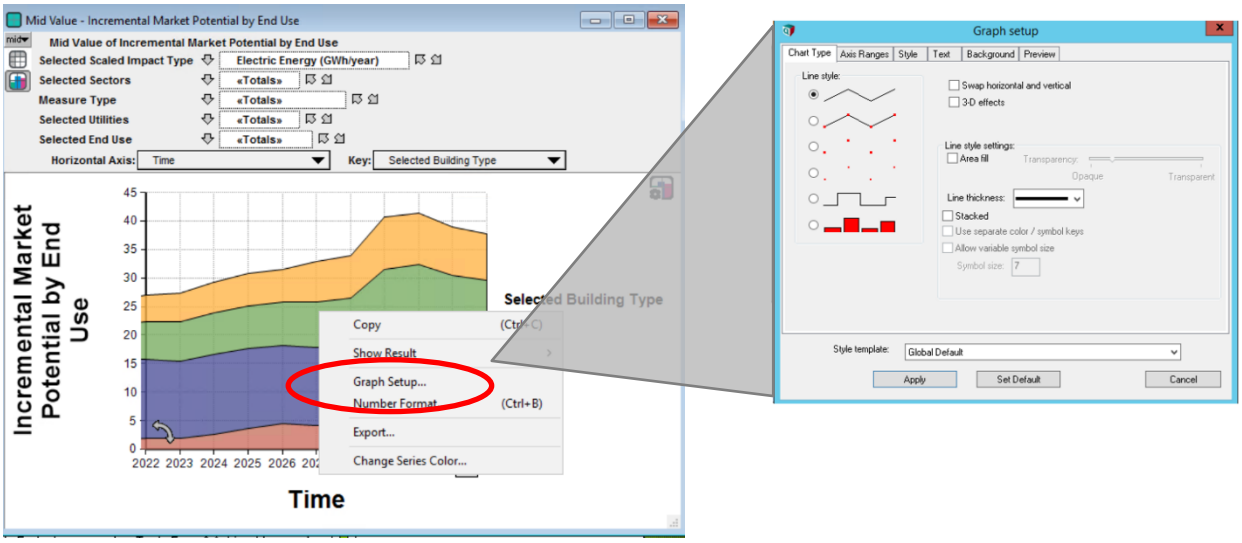
Figure 2-18. Opening the Graph Setup Dialog Box



5. You will now customize the Chart Type by selecting the “bar graph” icon under “Line style” and checking the box next to “Stacked”, before clicking on “Apply”. The updated graph should resemble Figure 2-20.

Figure 2-19. Customizing Chart Type

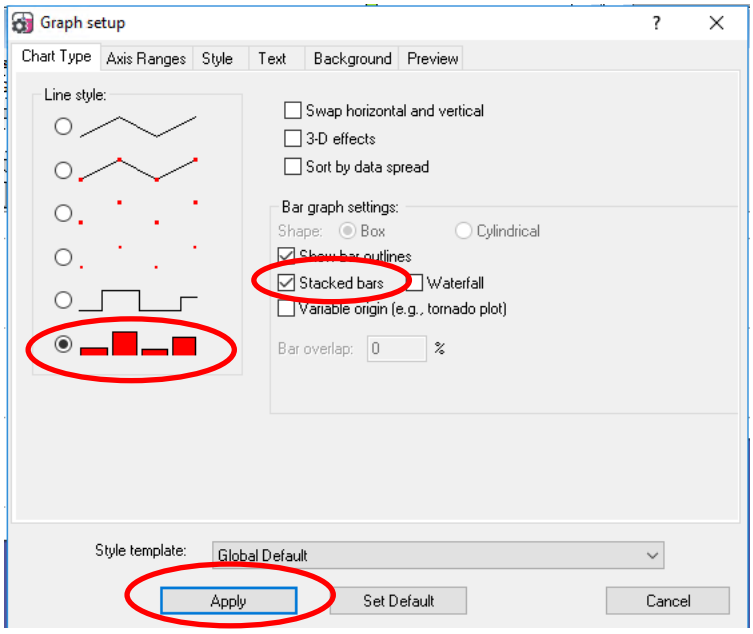


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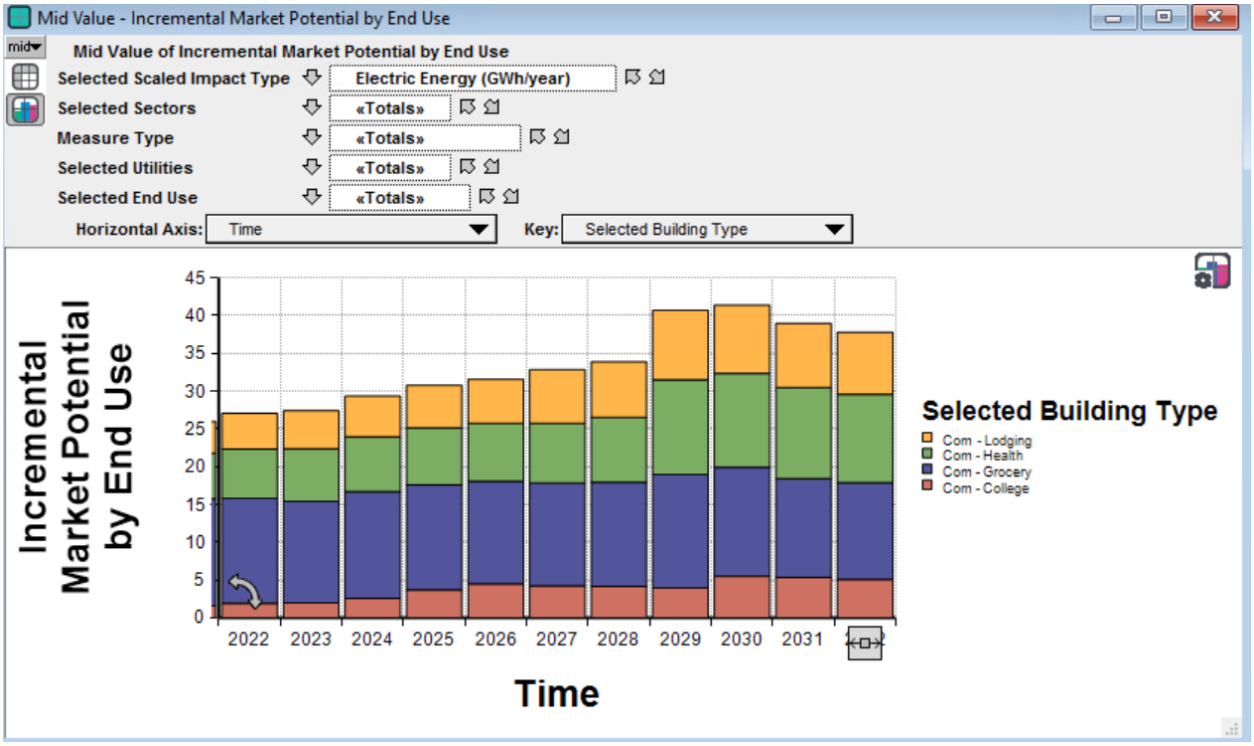
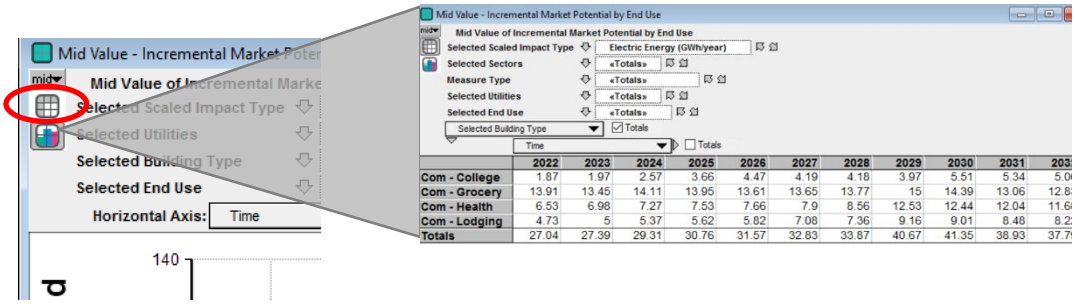
Figure 2-20. Graphical View after Changing Chart Type to Stacked Bar Graph



6. Finally, switch from the Graphical view to the Tabular view in Analytica by clicking on the numbered icon as shown on the top left of the graph.

Figure 2-21. Switching from Graphical View to Tabular View



2.2.5 Exercise: Copying and Pasting Results into Excel

There are several methods to copy and paste results to Excel. This exercise walks through each of those methods.

Goal: The goal of this exercise is to manually copy and paste results from the model into Excel using the CopyTable feature to copy multi-dimensional results into Excel. This offers a quick and easy way to port results into Excel. The one caveat about this approach is that the multi-dimensional results when pasted into Excel are in a format that makes it difficult to manipulate easily (e.g. using Pivot tables).

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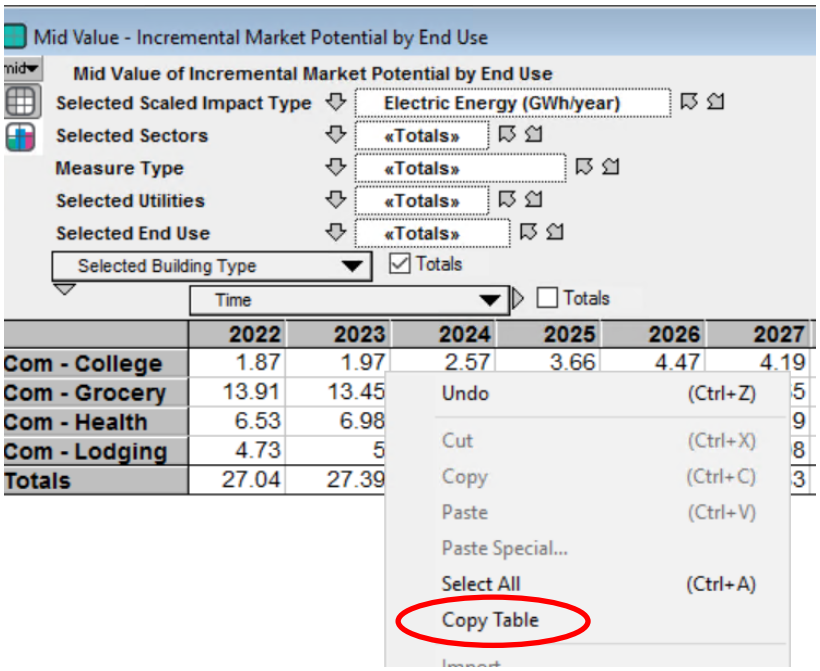
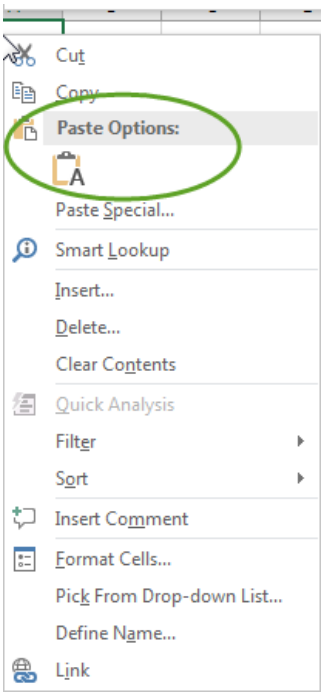
1. Re-evaluate Incremental_Market_P and switch to the Tabular view. Right-click on the table and select “Copy Table” as shown below.

Figure 2-22. Copy Table Function Illustration in Analytica



2. To paste the results, open a new Microsoft Excel workbook and right-click in an empty cell before selecting the “Paste” icon as shown below

Figure 2-23. Excel Paste Illustration



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The pasted multi-dimensional results in Excel will look like Figure 2-24.

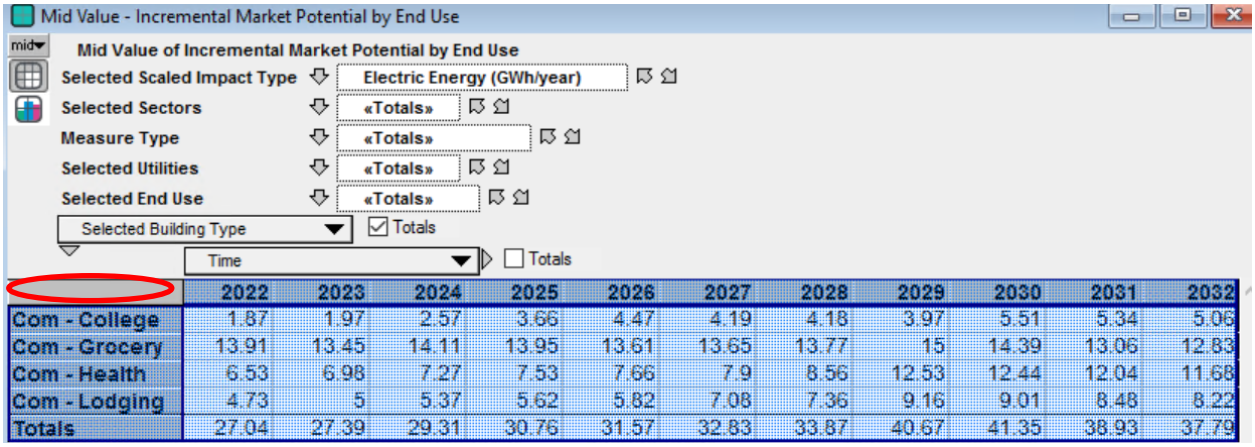
Figure 2-24. Pasted Multi-Dimensional Data in Excel

TextTable Value Incremental_Market_P						
Select_Scaled_Impact	Electric Energy (GWh/year)					
Selected_Sectors	Com					
Measure_Type	Energy Efficiency					
Selected_Utilities	PG&E					
Selected_End_Use1	AppPlug					
Time1	2018	2019	2020	2021	2022	2023
Selected_Building_Ty						
Com - College	0.016072	0.013698	0.012637	0.014048	0.015453	0.024892
Com - Grocery	0.001378	0.001266	0.000692	0.001302	0.00066	0.001095
Com - Health	0.028065	0.029542	0.022667	0.018565	0.017832	0.036766
Com - Lodging	0.005761	0.005471	0.004155	0.004108	0.004501	0.016088
Selected_End_Use1	BldgEnv					
Time1	2018	2019	2020	2021	2022	2023
Selected_Building_Ty						
Com - College	0.017949	0.021532	3.78E-05	0.000137	0.000285	0.0003
Com - Grocery	0.029663	0.024812	0.000114	0.000125	6.95E-06	6.6E-06
Com - Health	0.050065	0.053844	0.000783	0.000709	0.000748	0.000781
Com - Lodging	0.047087	0.046632	0.000766	0.000858	0.001037	0.001034
Selected_End_Use1	ComRefrig					
Time1	2018	2019	2020	2021	2022	2023

Goal: the goal of this exercise is to manually copy and paste a 2-D slice, rather than the entire multi-dimensional table, into Excel. Often, Analytica's formatting when using the CopyTable feature is difficult to work with, so this approach offers an alternative method.

1. With the Incremental_Market_P result window still open, click on the gray cell at the upper left-hand corner of the result table. This will highlight all data, column headers, and row headers in the slice of data being viewed. Use "CTRL+C" to copy the highlighted data selection (alternatively, you can right click on the data table and select "Copy").

Figure 2-25. Copying a Slice of a Data Table



	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Com - College	1.87	1.97	2.57	3.66	4.47	4.19	4.18	3.97	5.51	5.34	5.06
Com - Grocery	13.91	13.45	14.11	13.95	13.61	13.65	13.77	15	14.39	13.06	12.83
Com - Health	6.53	6.98	7.27	7.53	7.66	7.9	8.56	12.53	12.44	12.04	11.68
Com - Lodging	4.73	5	5.37	5.62	5.82	7.08	7.36	9.16	9.01	8.48	8.22
Totals	27.04	27.39	29.31	30.76	31.57	32.83	33.87	40.67	41.35	38.93	37.79

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2. The copied data can then be pasted into excel using “CTRL+V” (or using Excel’s paste features). The pasted data will have the same orientation as shown in Analytica (e.g., rows represent sectors and columns represent time). Note that the number format in Analytica does not always carry over to Excel, so it is best to apply number formatting directly in Excel.

Figure 2-26. Pasted Data Slice in Excel

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Ag	34.42097	30.5551	33.10169	42.17583	42.4402	40.84115	38.13854	35.04002	32.41979	30.4921	29.64208	30.03043	32.33511
Res	88.22169	25.64204	27.11595	45.18882	70.83667	79.7453	85.08083	89.11068	89.56228	88.19745	85.77016	84.05542	82.10134
Total	122.6427	56.19714	60.21764	87.36465	113.2769	120.5865	123.2194	124.1507	121.9821	118.6895	115.4122	114.0858	114.4364

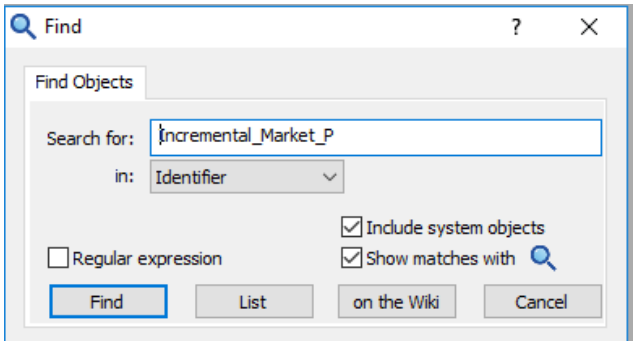
Tip: If you’re not interested in copying/pasting an entire multi-dimensional table or 2-D slice of a table, you can highlight just the (adjacent) cells of interest from a data table and paste them into Excel. Highlighting individual cells in Analytica is performed the same way as you would in Excel (i.e., click and drag your cursor over desired cells). Additionally, you can click on the row headers and column headers to highlight all cells pertaining to a selection of contiguous rows or columns, respectively, and copy/paste that subset of data into Excel.

2.2.6 Exercise: Finding a Variable using its Identifier

Goal: The goal of this exercise is to use the search feature in Analytica to locate a variable in the model. This is particularly useful if you know the identifier of a variable and are trying to locate it in the model. While this exercise illustrates how to search by using the identifier of a variable, it is also possible (and useful) to search based on the title of a variable.

1. Click “Ctrl +F” and search for the object Incremental_Market_P by using its identifier (make sure “Identifier” is selected in the dropdown) and clicking the “Find” button.

Figure 2-27. Searching for an Object Based on its Identifier



This should then launch the diagram window with the variable highlighted as illustrated below.

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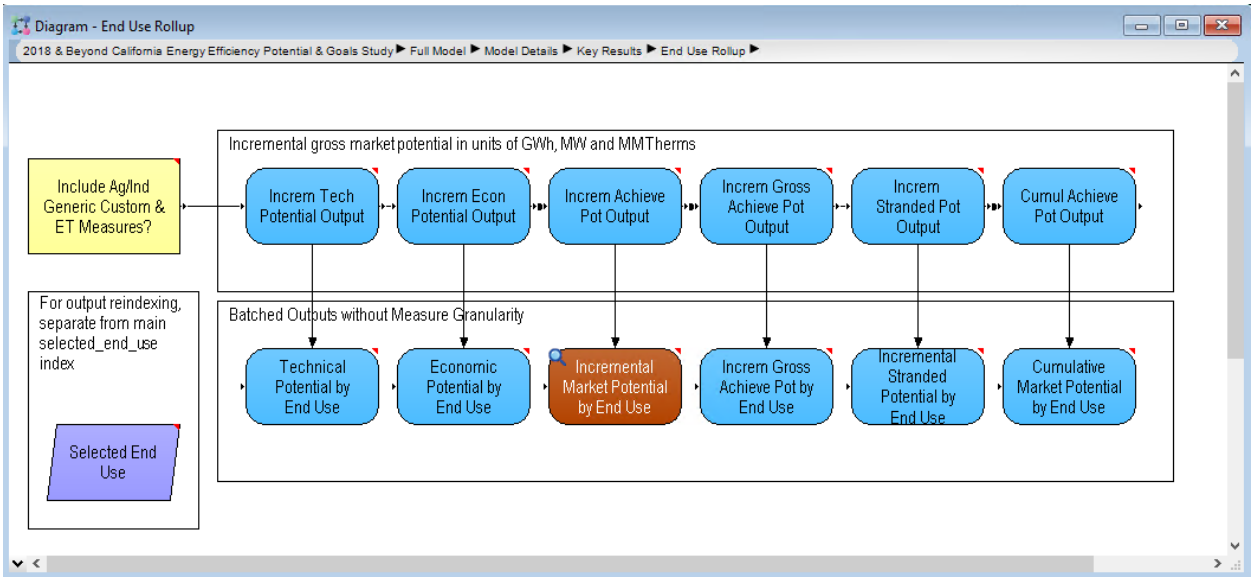
Figure 2-28. Diagram Window with Variable Highlighted



2.3 Navigating Through Model Logic

This section provides exercises that will help you get comfortable with navigating through the model logic. There are two main options for navigating through the model to explore the logic and locate select variables in downstream modules. This section offers an exercise for each of these options.

2.3.1 Exercise: Navigating using the Module Hierarchy

Goal: In this exercise, you will learn how to explore the model using the Module Hierarchy feature in Analytica. Often large models have many layers of hierarchy. The hierarchy depth of each module can be viewed by simply setting a global preference (covered below) at which point you will be able to easily navigate the hierarchy of the model.

1. Select “Preferences” from the Edit menu to display the Preferences dialog. Next, check the “Show module hierarchy” box as shown in Figure 2-29. After you do this, the top of the active Diagram window displays the module path to the current module:

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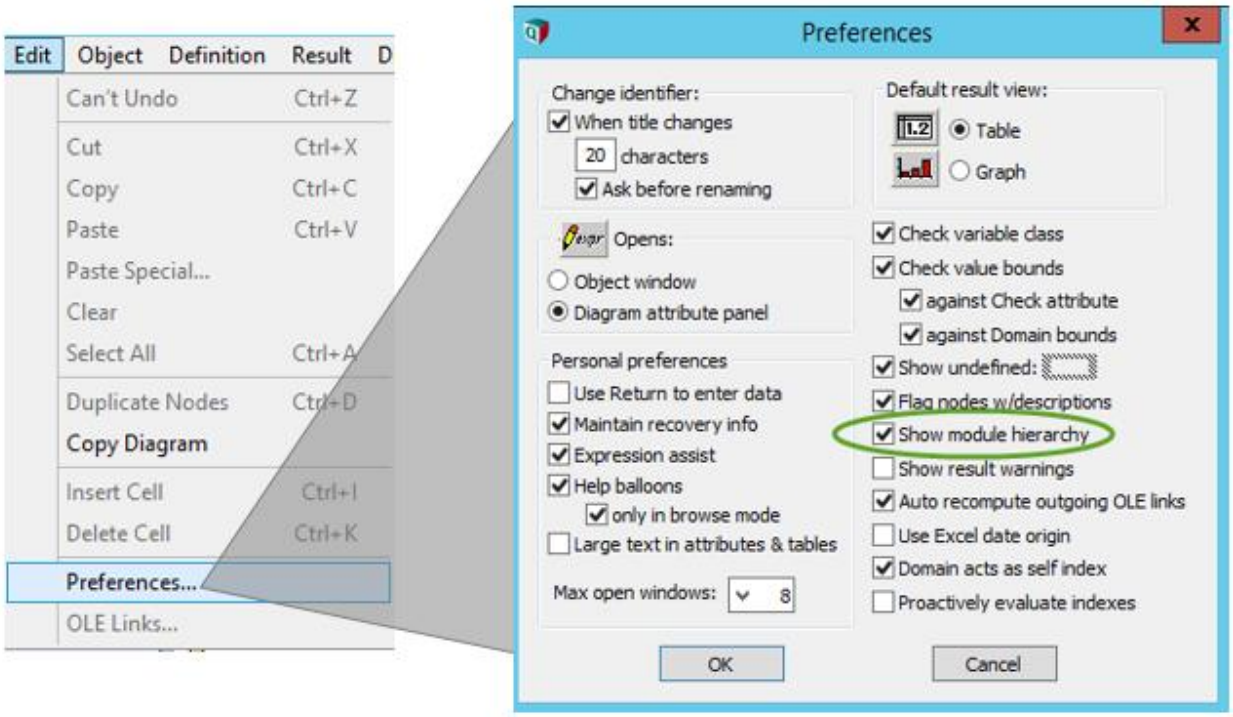
Figure 2-29. Show Module Hierarchy Preference Setting



2. Next, the goal is to use the module hierarchy outline to navigate to the Building_Stock module and locate the variable Bldg_Stk_by_Source. First, click on the black arrow next to “Full Model” which will open a tree menu as shown below. Click on the + sign next to “Model Details” and this should open a module hierarchy for the “Model Details” module. From there, navigate to the “Building Stock” module within “Building & End Use Stocks” module, as illustrated in Figure 2-30 and Figure 2-29.

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Figure 2-30. Access Building Stock Module Using Module Hierarchy

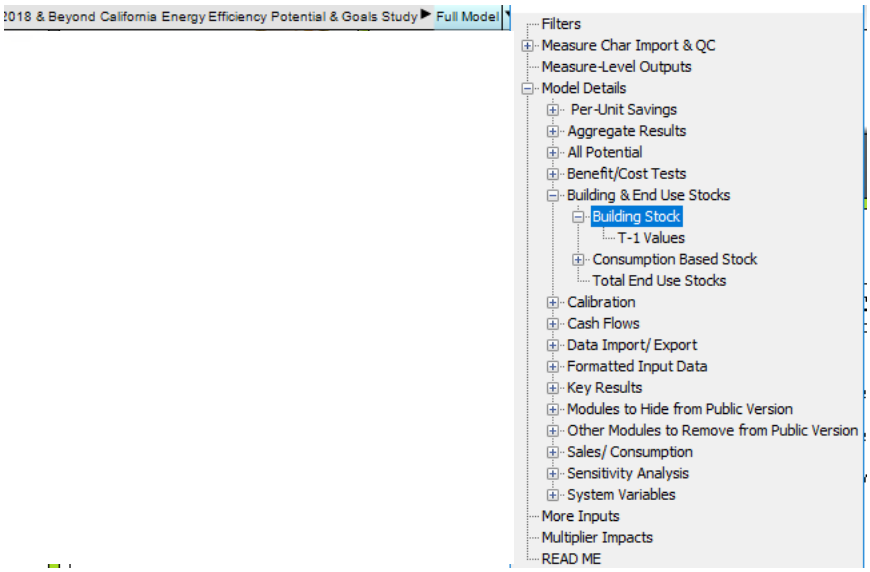
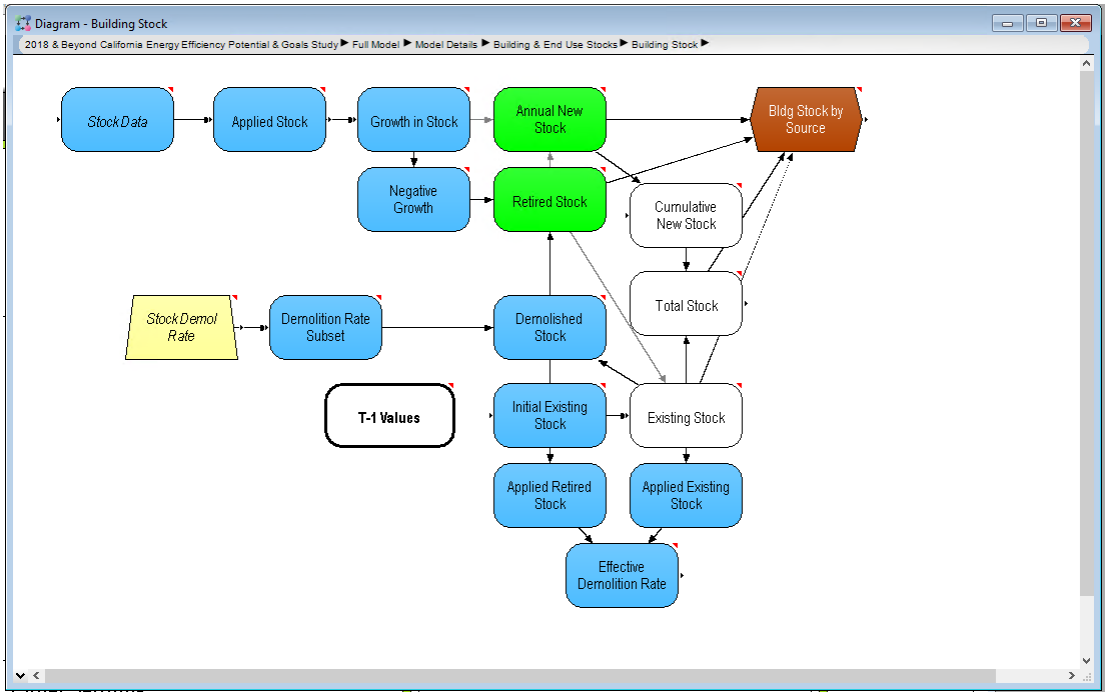


Figure 2-31. Example Influence Diagram



2.3.2 Exercise: Navigating using the Model Details

Goal: In this exercise, you will learn to use the "Model Details" module to navigate. This offers a second option for browsing the model logic.

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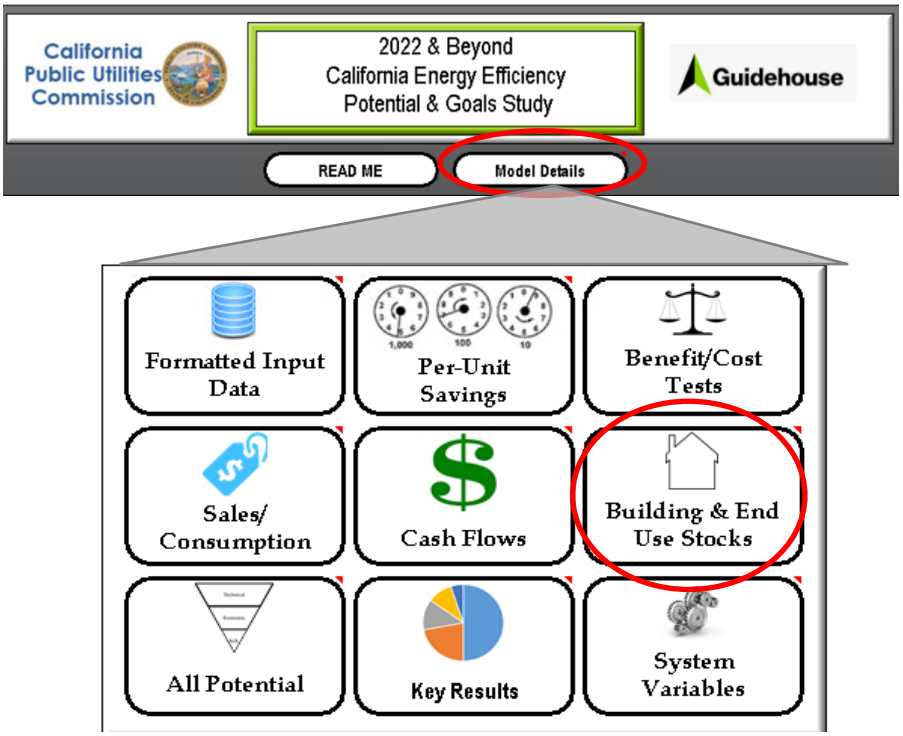
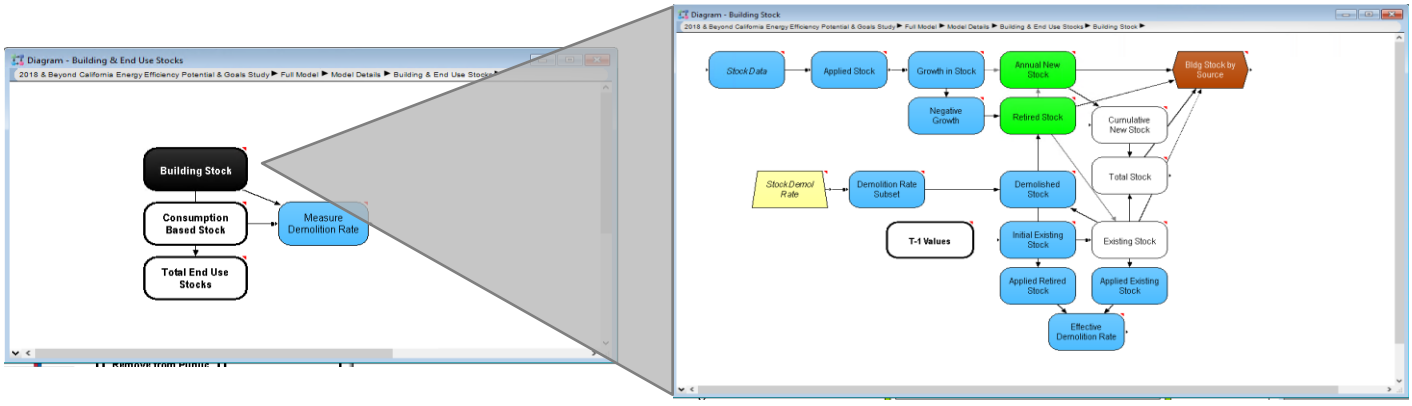
1. From the top-level GUI, under the title, double-click on the “Model Details” module, as shown in Figure 2-31.

Figure 2-32. Accessing Model Details



2. Next, double-click on the “Building & End Use Stocks” module under “Core Model Logic”. This will open-up a module with several variables and sub-modules. To launch the “Building Stock” influence diagram, double-click on the relevant module as illustrated in Figure 2-33.

Figure 2-33. Accessing the Building Stock Module



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